CHAPTER 1 - NEED FOR THE PROPOSED ACTION

INTRODUCTION

The Bureau of Reclamation (Reclamation) proposes to modify Clear Lake Dam, a feature of the Klamath Irrigation Project, to correct known safety deficiencies of the dam. This environmental assessment (EA) describes the environmental effects of modifying Clear Lake Dam. The EA describes the effects of two alternatives that have been considered in detail: (1) the No Action alternative (meaning no Federal action would be taken to correct the safety deficiencies); or (2) Proposed Action alternative of modifying the dam site by constructing a roller-compacted concrete (RCC) embankment immediately downstream of the existing embankment structure. The agency proposed action (and preferred alternative) is to modify the dam site by constructing a RCC embankment structure.

NEED FOR THE PROPOSED ACTION

Recent Safety of Dams (SOD) investigations of the dam indicate an unacceptable risk of dam failure under certain conditions (described later in this chapter). Reclamation recommended corrective actions be undertaken (Reclamation 1999). There is a need to take action to modify Clear Lake Dam under the Safety of Dams program because:

1. Reclamation is required to comply with the requirements of Safety of Dams Act. The Reclamation Safety of Dams Act of 1978 (P.L. 95-578, as amended) directs the Secretary of the Interior to preserve the structural integrity of Reclamation dams by performing modifications that may be reasonably required.

2. There is an unacceptable risk of dam failure due to the known safety deficiencies of the dam. Dam failure would result in an uncontrolled release of water and debris from Clear Lake. There is a need to reduce the potential for loss of life, environmental and property damage that could result from failure of the dam (Reclamation 1998, 1999b, 1999c).

3. Reclamation has a contractual obligation to continue water deliveries from Clear Lake for agricultural irrigation. Such deliveries are dependent upon Clear Lake Dam.

4. Failure of Clear Lake Dam would reduce flood protection for Tule Lake.

5. Clear Lake provides essential and necessary fish and wildlife habitats within Clear Lake National Wildlife Refuge that are dependent upon Clear Lake Dam.

The purpose of this EA is to describe the environmental consequences of modifying Clear Lake Dam. Reclamation is required to prepare the EA to comply with the procedural requirements of the National Environmental Policy Act of 1969 (NEPA). The EA will be used to determine whether to prepare a Finding of No Significant Impact (FONSI) or prepare an environmental impact statement (EIS). If the EA shows that the environmental consequences do not have a significant impact on the human environment, a FONSI will be prepared. If the EA indicates that the proposed action constitutes a major federal action significantly affecting the quality of the human environment, then a Notice of Intent to prepare a draft EIS will be published in the *Federal Register*.

DESCRIPTION OF CLEAR LAKE DAM AND ITS OPERATION

Clear Lake Dam - Clear Lake Dam is located within Modoc County in northern California, about 19 miles southeast of Malin, Oregon (Figure 1). The dam lies at the head of the Lost River, which flows northward from California into Oregon. The dam was constructed between 1908 and 1910 to increase the storage capacity of Clear Lake as part of the Klamath Project. The dam is owned by the United States and operated by the Langell Valley Irrigation District. The dam was subsequently raised an additional three feet in 1938.

The dam is an earth and rock fill embankment (Figure 2). It has a structural height of 42 feet and a crest length of 840 feet at elevation 4552.0. Total volume of fill in the embankment is 63,000 cubic yards. An uncontrolled side-channel spillway is located on the left abutment of the dam. The spillway was rehabilitated in 1974. The crest elevation of the spillway is 4543.0 with a crest length of 357 feet and a capacity of 5,650 cubic feet per second at water surface elevation 4545.7. A concrete slab protects the slope downstream from the crest. It is terminated by a 3-foot deep concrete cutoff wall in the channel bottom. The dam's outlet works consist of an inlet channel, an intake structure with two 4.0-foot by 4.75-foot slide gates, a control house, an outlet conduit, and an outlet channel.

Two dikes, built of rolled earth fill with a downstream rock fill zone, were constructed in shallow saddles at the south end of the lake. The main dike is 13 feet high and 1,600 feet long. The smaller dike was originally about 4 feet high and 1,200 feet long, but was raised 3 feet in 1975 to elevation 4549.0 to match the main dike.

Clear Lake - Clear Lake was a natural lake that existed prior to construction of the dam. The lake occupies a broad, flat alluvial basin in barren volcanic terrain. With construction of the dam, total capacity of the lake is 526,770 acre-feet of storage at spillway crest elevation 4543.0, with a corresponding surface area of 25,760 acres.

Normal Operation - Clear Lake Dam is operated to provide benefits for irrigation, flood control, and wildlife habitat. Water released through Clear Lake Dam provides the direct irrigation supply to approximately 10,896-acres of cropland within the Langell Valley Irrigation District and Horsefly Irrigation District. Irrigated agriculture in the districts consists primarily of pasture, alfalfa, barley, and livestock operations. Water is stored by Clear Lake Dam and prevents downstream flooding of the historic Tule Lake, thereby allowing agricultural use of about 17,500 acres of reclaimed lands. Annual direct irrigation deliveries from Clear Lake Dam during the period from 1962 to 1997 ranged from just under 8,000 acre-feet to over 43,000 acre-feet, with average annual irrigation deliveries being 34,560 acre-feet. Reservoir operations are conducted in accordance with the Standing Operating Procedures for Clear Lake Dam and the July 1994 Biological Opinion on Operation of the Klamath Project of the U.S. Fish and Wildlife Service. Under that opinion, the reservoir is operated to assure a minimum surface elevation of 4521 on October 1 annually. Releases from the lake for irrigation and other purposes cannot be made before April 15 or until 80 percent of the larval fish have returned to the reservoir from spawning habitat in tributaries flowing into the lake. A large mesh barrier net was installed in the lake around the dam outlet works to restrict juvenile and adult suckers from leaving the lake during the irrigation season.

Flood Operation (existing) - From October 1 through March 1, reservoir storage is limited to 350,000 acre-feet (Elevation 4536.4). After March 1, the allowable storage increases to elevation 4537.4. Temporary floodwater storage is allowed up to elevation 4543.0 (top of exclusive flood control and elevation of spillway), in order to limit or smooth out Lost River flows through Langell Valley and Poe Valley. Water above elevation 4537.4 must be released in a timely manner, while minimizing

downstream flooding and damage. The Clear Lake watershed does not experience heavy rainfall runoff during the summer and fall seasons. Consideration of flood control releases is necessary only during extremely rare summer thunderstorm occurrences when the reservoir is full. Releases in excess of the normal irrigation release are made to reduce the active carryover storage to 350,000 acre-feet by October 1. Following the irrigation season, no additional drawdown (except as necessary to reduce the active carryover storage to 350,000 acre-feet) is made for flood control until there is some evidence of the magnitude of potential snowmelt runoff which indicates that additional drawdown is necessary to assure safe operation of the dam.

Jurisdiction - Reclamation has primary jurisdiction of the dam and its appurtenant facilities and the area immediately adjacent to the dam (about 480 acres) and is responsible for ensuring continued operation of the dam consistent with the primary purpose of the Klamath Project. Project irrigation water is currently delivered by the United States to Langell Valley Irrigation District (LVID), to Horsefly Irrigation District (HID), and to others. Tulelake Irrigation District (TID), LVID and HID have repaid a portion of the construction and operation and maintenance costs associated with Clear Lake Dam.

All lands adjacent to Clear Lake, except the area of Reclamation's primary jurisdiction directly surrounding the dam site, have been transferred to the U.S. Fish and Wildlife Service for management as the Clear Lake National Wildlife Refuge. Before the transfer, an agreement was executed that gives Reclamation certain rights to flood lands adjacent to the lake and to operate the dam. The Modoc National Forest surrounds the refuge and is administered by the U.S. Forest Service. Maintenance of the access road to the dam is the responsibility of the Forest Service. A cooperative agreement is occasionally executed to fund repairs of this road. No recreational management plan is in effect. Clear Lake is remote, with no timbered areas. Public visits are infrequent and consist primarily of hunters and ranchers.

BACKGROUND OF CLEAR LAKE DAM SAFETY OF DAMS DEFICIENCIES

Historic performance of dams with designs similar to Clear Lake Dam has been poor. Several dams built with a similar design have either failed or experienced major seepage or internal erosion occurrences. Clear Lake Dam has shown signs of poor performance, such as crest cracking and significant increases in seepage at historic high reservoir levels. Clear Lake Dam was investigated pursuant to the Reclamation Safety of Dams Act (Public Law 95-578) and it has been determined that the dam does not meet state-of-the-art design standards, such as having a properly designed filter system to prevent piping and/or internal erosion (Reclamation 1998, 1999b). The risk of static failure of the dam, based on piping and internal erosion failure modes, provides significant justification to take action to reduce the risk of dam failure. Further, the risk of failure increases with rising reservoir elevation. Potential failure modes identified for the dam are:

1. Long-term effects of seepage to the performance and safety of the embankment - The examination included an evaluation of the potential for piping of the Zone 1 core material into or through the downstream rockfill. Seepage through the embankment and/or foundation has been low with no evidence of piping materials. However, due to the uncertainties of the embankment's performance under sustained high reservoir levels, the failure potential from seepage is judged to be low to moderate.

2. Transverse and longitudinal cracking was noted on the crest of the dam - The significance of existing transverse and longitudinal cracks on the right abutment of the dam was evaluated. The cracks were found during a period of historic high reservoir levels. They were thought to be a result of the uneven settlement of materials that were previously not saturated and

had become wetted. However, piping cannot be ruled out as a possible cause of the cracking. Based on the lack of data on the cracks and the historic low reservoir levels, the failure potential of the dam with respect to cracking is judged to be moderate.

3. Filtering capability of the transition material between the earthfill and rockfill zones - The limited data gathered from an evaluation of the filtering capability of the transition material between the earth fill and rock fill zones suggest it does not satisfy requirements as a filter zone. However, no piping of materials has ever been documented at the dam. In addition, field explorations show that the transition material may not be present in some areas. Geotechnical analysis indicated that zone 1 clayey material would not allow the circulation of water (or was non-dispersive). Due to the lack of filtering, and the limited experience with performance of the embankment at high reservoir levels, the potential for failure of the dam with respect to piping is judged to be moderate.

Reclamation (Reclamation 1999b, 1999c, 1999d) concluded that approximately 95percent of the risk of failure of the dam is due to piping or internal erosion failure under static (unchanging) loading conditions. Under Reclamation guidelines, the risk of static failure of the dam, using median estimates, indicates a strong justification to reduce risk. The remaining five percent risk of dam failure is due to piping or internal erosion failure resulting from an earthquake-induced cracking of the embankment. The justification of reducing the risk of an earthquake-induced cracking is less than static failure of the dam. Based on estimated warning times, the loss-of-life expected due to static failure is less than one, but higher for an earthquake-induced cracking. Based upon historical operation data, Clear Lake has operated between elevation 4525.0 and 4534.0 90 percent of the time (Reclamation 1999d).

DECISIONS TO BE MADE

Reclamation will use this EA and other relevant information to make the following decisions regarding modification of Clear Lake Dam: (1) Should Reclamation modify Clear Lake Dam to correct the known safety deficiencies?; (2) How should Reclamation modify Clear Lake Dam? and; (3) Does the proposed action constitute a major federal action significantly affecting the quality of the human environment necessitating preparation of an environmental impact statement?

PERMITS AND AUTHORIZATIONS NEEDED

Reclamation would obtain the following permits and authorizations to implement the proposed action as displayed in Table 1.

Table 1 - Permits and Authorizations Needed
Clear Lake Dam SOD

Authority	Permit/Authorization Needed	Responsible Agency
Clean Water Act	Section 401-Water Quality Certification	California Regional Water Quality Control Board and State Water Resources Control Board
Clean Water Act	Section 402-National Pollutant Discharge Elimination System Permit	California Regional Water Quality Control Board and State Water Resources Control Board
Clean Water Act	Section 402 - Stormwater Discharge Permit (for project actions that result in storm water discharges from construction activities that disturb five or more acres of land).	California Regional Water Quality Control Board
Clean Water Act	Section 404 - Permit to Discharge Dredged or Fill Material into the Waters of the United States	U.S. Army Corps of Engineers
	Permit for Non-Federal Commercial Use of Roads Restricted by Order	U.S. Forest Service

SIGNIFICANT RESOURCE ISSUES

The following resource issues have been identified as the significant issues that should be analyzed in detail in this EA. They were identified through appropriate scoping activities conducted by Reclamation and will guide the analysis of impacts. The resource issues are briefly summarized in the following analysis questions:

1. Cultural Resources - How would the proposed action and alternatives affect cultural resources and the historic Clear Lake Dam?

2. Threatened and Endangered Species - How would the proposed action and alternatives affect two endangered fish, the Lost River and shortnose suckers, that inhabit Clear Lake and the Lost River?

3. Wetlands and Riparian Areas - How would the proposed action and alternatives affect wetlands adjacent to the Lost River and Clear Lake?

4. Livestock Grazing - How would the proposed action and alternatives affect livestock grazing on a grazing allotment along the Lost River administered by the U. S. Forest Service?

5. Clear Lake National Wildlife Refuge - How would the proposed action and alternatives affect fish and wildlife habitats/populations within the Clear Lake National Wildlife Refuge, including various birds that nest in and around Clear Lake, such as the white pelican?

6. Irrigation Use and Flood Control Benefits - How would the proposed action and alternatives affect two irrigation districts, Langell Valley and Horsefly, that rely on Clear Lake for irrigation deliveries? Clear Lake Dam also provides flood control for reclaimed lands of the former Tule Lake, including the towns of Tulelake and Malin.